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**Liquid IT**

This White Paper from the Atos Scientific Community describes a concept of flexible and cost-effective IT services that can be provisioned, built and configured in real time, allowing end-to-end financial transparency.

The main drivers for this major evolution include business agility, investment-free charging models, flexibility and ease of use. Liquid IT leverages the Cloud foundation technologies as well as other advances in mobility, security and network management.

The requested adaptation of the IT governance models, including the emergence of the Service Integrator role, as well as possible financial models for the correct chargeback of IT services, are also described.

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# Liquid IT

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#### About the Authors

Edited by Philippe Reynaud  
(philippe.reynaud@atos.net)  
Vice President Portfolio & Innovation, based on contributions from:  
Paul Albada Jelgersma, Thierry Caminel, Jose Esteban Lauzan, Jordan Janeczko, Bas Heeringa, Ana Juan Ferrer, Guy Lidbetter, James McMahon, Martin Pfeil, Rob Price, Purshottam Purswani, Udo Sebald, Francisco Jose Ruiz Jimenez and Boris Scharinger.

#### About the Atos Scientific Community

The Atos Scientific Community is a network of some 100 top scientists, representing a mix of all skills and backgrounds, and coming from all geographies where Atos operates. Publicly launched by Thierry Breton, Chairman and CEO of Atos, the establishment of this community highlights the importance of innovation in the dynamic IT services market and the need for a proactive approach to identify and anticipate game changing technologies.

# Introduction

The volatility in both the consumption and provision of IT has led us to the concept of Liquid IT. The concept of ubiquitous computing power and connectivity, the limitless provisioning of software and storage that is easily turned on and off to get more or get less - just like a tap - has led to the term **Liquid**. From a customer or user-based outside-in approach, Liquid IT is not about IT. It is about streamlined business processes and business agility that takes advantage of IT never being the bottleneck to addressing new strategic initiatives. At the same time it gives full financial transparency to the cost of the supporting services so that the required business decisions can be made in real time. This white paper shows the contributions that have to be made by IT, the CIO and other organizational changes to enable the realization of Liquid IT.

## Why?

**Speed** is the first driver for Liquid IT. Speed brings together two major business drivers: lead time and performance. Firstly it addresses the fact that IT availability is a given, so there is no time lost in setting it up. Getting access can be achieved quickly using existing infrastructure such as the internet and scalability is easy through standardization and ever present connectivity to all locations. Agility in providing new business services to enable growth and quick reaction in changing environments is also part of the Speed driver. The applications requested to support new business processes are supposed to be made available in real-time, as selected from a catalogue. Performance is the second aspect of speed. Business nowadays depends on the ability to scale up and down IT resources as needed in the blink of an eye, whether to address seasonal, periodic or unanticipated demand. So applications are not just only "available" but able to perform their function with the performance optimal to the business need. Because of the financial model and standardization speed can also be throttled up and down, which contributes to the fluid nature of IT.

**Cost** is the second key driver. In fact, cost in itself is not the primary driver; it is changing the cost model itself that brings the real value. Hardware and software costs, datacenter energy and square meter pricing are still

the same, but the way we arrange payment between providers and users changes and allows for the pay for usage and cost of consumption models. This is also known as the transfer from CAPEX to OPEX. There is no longer any upfront lump-sum payment for providing or consuming IT. It is now financially engineered to mimic the way we consume electricity and water. This financial model creates large benefits and most of all fits the commercial model that companies and end users need in the current economic climate.

Liquid IT will drive Liquidity, as computing power becomes a commoditized asset. Agile architectures will facilitate trading of assets from supplier to supplier, not every five years or annually as today, but even on a daily or hourly basis.

**Flexibility** is the third driver, flowing from users who are continuously challenged in a changing environment. Through flexibility in IT, they require more or less, depending on circumstances. The need is also driven by the huge amount of information processed by any IT system. This flexibility allows a progressive ramp-up in access, storage and functionality, typically starting with a small number of subscribed users that increases in number and the users themselves requiring access to an increasing number of services. Flexibility also involves the possibility to assemble several basic business services to support a new business process.

The value of information, which in itself could be seen as a consumer of IT needs the flexibility of IT. Information needs to show its value to the consumer; sometimes by answering just simple queries and sometimes by doing complex analytics on large datasets.

**Ease of use** is the fourth and final driver. Through standardization, better understanding of needs and corresponding cost models and driven by the need of speed, investments will be made in allowing both easy access to and disconnection from IT services. To support the user's profile and adapt accordingly, flexibility should not be translated into complex contracts or set up processes. The required ease of switching on and switching off drives the realization of Liquid IT.

## How is Liquid IT different than Cloud Computing?

Cloud Computing has profoundly transformed the way IT services are delivered, leading to the IaaS, PaaS and SaaS models. It has also dramatically changed the expectations of users in the way they consume IT: the focus has shifted from buying IT to using IT. There is a conviction that the necessary computing power, storage space, connectivity and intelligence provided by applications will just be there and we move to a subscription-based usage model.

Liquid IT starts from the business needs: speed, savings, flexibility, and ease of use. It leverages the Cloud foundation technologies and delivery models, as well as other advances in mobile devices, federated security, network architectures and SLA management. But it also embraces fundamental changes in financial management and governance, in order to eventually enable the agile business environment needed by today's organizations.

## Benefits & Implications

Liquid IT results in universal access, computing, storage and information power. To enable this collaboration, the IT industry and its providers need to change the way in which IT is built, operated and invoiced. This is not just about cloud computing. It is about information management, access control and standardization. Liquid IT will bring increased usage and we can also expect a stronger split between the owners of IT and the users of IT. Most benefits will initially be seen by users; pay as you go, easy access and ubiquity in information will all increase the quality of service. It will therefore appear that the risk and investment is transferred to the owners of IT. However, in the long run, the owners have the governance and stewardship of all elements that make up the IT landscape.

## A definition of Liquid IT

### From a Business User standpoint

For a Business user, Liquid IT is certainly not about Technology. It is streamlined business processes and simplified access to IT services that take full advantage of available commercial models, where the connection between device and IT services is automated and the resulting user experience seamless. The separation of device and application, while maintaining specific content delivery connecting users to services, means that Liquid IT completely hides the user's perception of where services are running - to the point where users realize it no longer matters. The application/service/process is running where context and policy deems best, including allowance for any security constraints that may apply.

Liquid IT enables fast, dynamic deployment of IT services according to business criteria while hiding all technical details behind a self-service portal. The whole IT stack will be transformed into building blocks - from IT infrastructure to high-level applications to the interfaces to support desks ensuring business continuity - capable of being easily combined to create an overall solution. Service usage must be capable of automation at all levels. Business models must be based at all levels on "pay per use" with chargeback mechanisms to allow building blocks to be combined into one bill, whether weekly, monthly or even only once. Eventually, this will promote innovation in business processes and models, and enable fast adaptation to new strategies.

### From a CIO standpoint

For the CIO office, Liquid IT is seen as a way to design, build and provide IT services to bring transparency to the user, in multiple dimensions: ease of use, cost/finance, provisioning/demand models, security and privacy. The following features are involved:

- ▶ Building blocks with a high level of standardization and interoperability to support seamless management of quality across abstraction layers (QoS, SLA, BLA)
- ▶ Flexible integration/orchestration supporting stepwise migration and transition approaches
- ▶ Automated mechanisms for the global orchestration of the IT infrastructure for fast provisioning and decommissioning
- ▶ Consistent use of federated identities for all building blocks to enable the necessary authentication and authorization of services to users
- ▶ Network expansion for identity-based access, decreased latency, scalable bandwidth, and software defined sub-networks for both LAN and WAN
- ▶ Provision of standard business services, charged in a pure OPEX model (pay per subscription or usage), and eventually with a try & buy possibility
- ▶ "Liquid Integration" into the customer ERP system to decrease overall cost of ownership.

In many ways, the business benefits of virtualization have been fully realized by the emergence of Cloud Computing. Similarly, the advantages of Cloud Computing will not be fully leveraged without the adoption of the Liquid IT paradigm.

Business agility is the main result of Liquid IT.

# The journey to Liquid IT

A journey towards Liquid IT is actually rather subtle, and it is much more than a technology journey. To fully benefit from Liquefying IT there must be changes to technology, business processes and financial processes, with targets radically different to today's conventional wisdom and methods. Before describing the main phases of this transformation, we need a reminder of the main objectives that we aim to achieve during this journey:

**Business agility:** The ability to automatically make infrastructure changes to optimize a business process based on the immediate needs of the process, continuously, automatically and proactively, without interruption, is something that can provide unique benefits in the future. During this transformation, the functionality of Business Processes cannot be altered, but the individual steps, or services, would be externalized. To allow this evolution, a flawless formalization of the business processes is fundamental.

**Flowing capacity:** Most of the legacy applications will be virtualized and hosted within the cloud, potentially increasing the availability and Disaster Recovery/Business Continuity options for the application. Application components may need to be broken down in smaller services that can be re-architected to take advantage of the flexibility of Liquid IT.

**Liquid experience:** Business services should be accessible from anywhere and any device and users will experience a new way of consuming IT starting from the service subscription via app store, to constantly adapted content and services through the integration of user context (location, connection quality, and device).

**Financial transparency:** end-to-end cost transparency will drastically improve the chargeback potential, and financial liquidity will be obtained from the strong reduction of CAPEX needs.

In order to achieve all those goals, the IT transformation journey can be structured among three main pillars: technology enablement, business model transformation and financial management. More than sequential phases of a project, these pillars can be executed as parallel tracks, even though certain dependencies do exist.

## I. Technology enablement

▶ The technological facets of the liquefying program mainly consist of building a private or hybrid Cloud. The main tasks typically start with the design and setup of a fully dynamic infrastructure: servers' virtualization, unify storage and business continuity... and other features considered at the Infrastructure as a Service (IaaS) level. Next services at the Platform as a Service (PaaS) level need to be considered, this includes: all security features (Identity and Access Management with Single Sign On), virtual desktop, provision automation, corporate app store, etc.

For a more detailed description, please refer to "[Fluid Service Platform](#)".

## II. Business model transformation

The complete redefinition of the CIO office roles and responsibilities and its relationship with the Business Units, is certainly the most subtle pillar when liquefying IT. This includes the creation of the **Service Integrator** function, and a complete redesign of the current governance. New roles and objectives will be created, re-skilling (or recruitment) of IT professionals is needed, and new objectives, much more aligned with the BU objectives, will be set. Internal communication, and more generally front-office capabilities will be significantly improved.

The next chapter includes an overall description of the new CIO office.

The journey to Liquid IT goes beyond technology.

## III. Financial Management

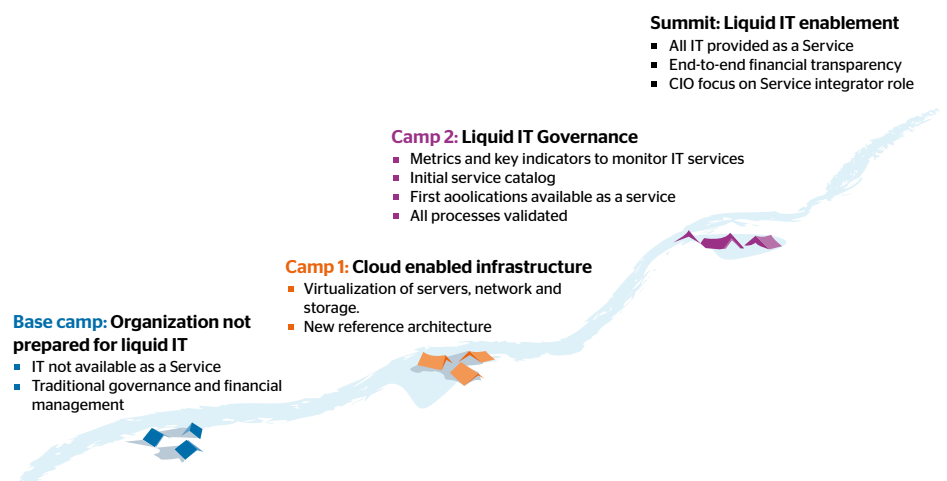
The main purpose of the financial track is the definition of the entire possible end-to-end financial scenarios, from the service delivery to invoicing. Budget ownership as well as charging methodology will be agreed, and the available invoicing policies (cost allocation) will be clarified. As a result, all IT services made available will be aligned to a well-defined and understood financial scenario.

The main outcomes of this track are described in "[Financial Transparency](#)".

## A phased journey

The journey to Liquid IT is rather complex and full of obstacles. Consequently, even if these three pillars can be addressed simultaneously, a phased approach with clear intermediate objectives will be used, enabling strong governance of the progress made and mitigating the risk of resistance to change. An example of such a phased journey is shown in the following illustration:

### The phased journey to Liquid IT



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# The evolution of the CIO office

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"It is 2016. My role (the **CIO**) has been the subject of much debate and discussion over the past few years. We have seen thought leadership evolving the **Chief Information Officer** into the **Chief Innovation Officer** or **Chief Integration Officer** and distancing from the never yet actually called, but often found **Chief IT Officer**. In truth, they are all right and all misleading.

In many ways, the role today is about trading computing power, and aligning it, reliably, to the business at the point of need. We call it Liquid IT. The need is evolving faster than ever before. The end consumer is driving immediacy of service that demands a level of agility within the business not previously seen. Those businesses that have not been able to satisfy that demand,

retaining the ability to drive cost efficiency, have not survived. Those that were able to evolve their enabling business technologies, underpinned by commoditised computing power, have.

Cloud started it, but Liquid IT platforms were the tipping point. Moving the IT platform to a zero latency provisioning and decommissioning model, complete with genuine utility pricing based on actual resource consumed enabled us to drive the optimal blend of minimising cost and maximising agility.

It's really all about the information - the ever-growing amount of data we have to manage. **Agile, scalable accessibility, availability** and **computing power** are now a necessity; not because they are there, but because our business model demands it."

The service integrator is in charge of the end-to-end quality.

## Evolution of the CIO as member of the Board

Up to 2012, many CIO's were still predominantly involved in supply-side IT delivery and tending of the underlying infrastructure, even when delivery of the infrastructure had been outsourced. For this type of CIO, a genuine on-demand, turnkey platform provided as Liquid IT, could result in the business functions taking direct responsibility for negotiating their own infrastructure provisioning and capacity purchase; because they own the demand and best understand the usage profile of the required IT resources. If significant capacity is needed to support a promotional campaign, why would the Chief Marketing Officer need to mediate this through the IT demand process; IT Program Board; CIO sign off; and the outsourced service provider - when they could interface directly with the IT platform provider.

The alternative, more optimistic outlook for the CIO was that this change would free them from the 'albatross' of heavily negotiated service delivery and allow them to genuinely take control of the 'I' in IT. The most strategic presentation by a CIO to their Exec colleagues or senior stakeholders could be totally undermined by any ongoing or recent critical service outage (for instance, 'don't come talking to me about Digital Transformation when you can't even get email working!'). If the business can start to appreciate IT provision as a utility with a direct interface around the amount of IT needed and consumed, then the CIO can move into a more strategic and transformational role.

The emergent opportunity for the CIO is to provide the most cost effective IT service platform, fusing together a range of commodity cloud based services, some of which are identified by the CIO and their team and some of which are procured directly by other areas of the business. Enabling fluidity of information flow across that rapidly changing estate while minimizing cost and service loss is the target.

## The Liquid IT Operating Model

To enable the transition to exploit ready availability of commodity computing power, it is time for a new IT Operating Model (ITOM) one that helps define an end state to anchor the transformation required by the CIO, senior business leaders and the IT function to embrace Liquid IT. Undoubtedly, this will be defined by significant reductions in traditional components such as platform management, service delivery and fundamental IT architecture, but will demand new capabilities and behaviors around commerciality, procurement and trading.

A Liquid ITOM is an evolution of the traditional IT Operating Model, designed to provide the flexibility and focus needed to get the best value out of traded cloud suppliers and their redesigned retained IT organizations.

It represents the process of linking together and orchestrating different component services and capabilities so as to provide the service consumer with an end-to-end service that delivers value. Within this context a key

assumption is the ability to decompose an end-to-end service into smaller component services (each of which can be traded as commodity computing power, with minimal transition) which can then be re-constituted into an end-to-end service without loss of functionality or integrity.

The retained function of this new IT Operating Model has two core focuses, the first of which is strategic - an emphasis on **agile translation of business demand**, expressed with ever greater immediacy. It is this that enables the differentiation of the service that the CIO provides to the business, having the highest impact on the ability of Liquid IT to use technology to shape and enable the execution of business strategy.

The second part of the Liquid ITOM enables **traded Service Integration**. It is the evolved service management capability, now fused with commercial (procurement, legal, value, arbitrage, intermediation) utility trading and enabling rapid information flow between service components according to their availability on a traded market. Where once contracts were let for years, it will be possible to trade computing power on a continual basis - looking to procure the most cost effective service at the most reliable proven availability at any specific point in time.

## From Benchmarks to Automated Analytics

Benchmarking of service components against competition must be established such that those IT services can be traded with near certainty. A scorecard assessment (including cost, time to provision and decommission, time to reach the expected business benefit) needs to be achieved, and it will be essential to access regularly updated market benchmarks and drive **automated analytics** of service component performance if there is to be rapid switch out and replacement of Liquid IT components.

Benchmarking and visible analytics of performance is a good lever to reduce **Shadow IT**. Business Units would be keen on using IT orchestrated services when confident that they are competitive in cost, quality and time to market in addition to the confidence of the CIO function to manage and protect the integrity of information between those IT services.

## Reskilling

Legacy IT skill sets will be strained as the CIO demands a shift towards a more commercial, more financially astute retained workforce. Ironically, as the CIOs look to establish themselves in the post-CFO reporting line era, the very nature of their responsibility is shifting ever more towards financial control of the exploited commodity. Another significant capability to be developed is **marketing**: an efficient promotion of all the available services to internal BU (and eventually external users) becomes mandatory, and will also contribute in reducing the Shadow IT.

## Enabling the Option of Recharging at Point of Consumption

Liquid IT is a logical next step in the evolution of a CIO's responsibilities and focus. A CIO now needs to balance the competing demands of technology-enabled innovation; accelerated realization of full business benefits; prioritization and creation of the optimum project portfolio; and consistent delivery of the IT element of business programs. This means that provision of stable and effective IT platforms, whilst critical to business operations is a given, which only gains attention through its absence or during the annual budget cycle.

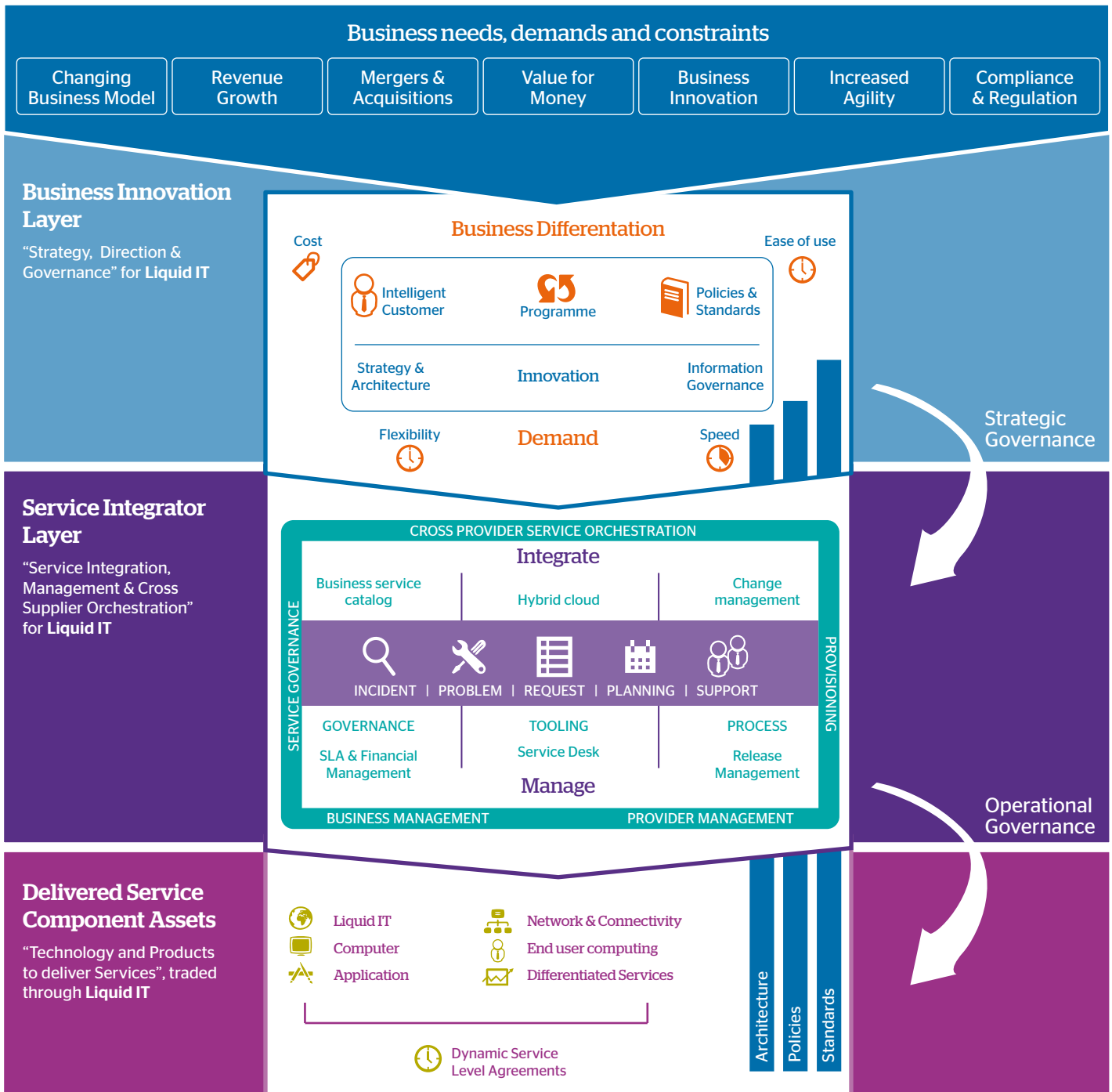
Against this backdrop, full adoption of Liquid IT could lead to the delegation of IT costs to the business. One of the main problems with IT budgets in the past has been agreeing on a fair basis of apportionment. There has always been the first user problem for shared resources - How to ensure that the first application to use a new platform does not bear a disproportionate cost and effectively cross-subsidises subsequent applications.

The diagram in the following page illustrates an example of Liquid IT Governance Model; and the next chapter includes a description of the budget governance, which aims to enable better decision making by the business.

Automated benchmarking will lead to the rapid replacement of IT services.



## Illustration of a Liquid IT Governance Model



# Financial Transparency

The journey to Liquid IT includes a disruptive change in the finance model of the CIO office. Internal IT has been generally considered as controlling the overall IT spending: an overall budget is requested, (negotiated) and granted every fiscal year, and the CIO is responsible for the delivery of the specified IT services under determined SLAs. As explained earlier, moving to Liquid IT, the CIO office has more of a broker role, providing the Business Units with both internal and external IT services in an on-demand and CAPEX-free scheme. Under this principle the CIO's main responsibility is focused on the provision of quality IT services with competitive unitary cost.

## IT Budget ownership

When IT is delivered as a Service, the CIO cannot control the demand (consumptions of IT as a Service) hence he cannot be held accountable of the overall IT spending. His responsibility is focused on delivery of the demanded services at the agreed quality level and at competitive unitary costs. As the business evolves, new functionality, services, capacity may be needed and internal IT will have to be prepared to deliver, but without having to stick to a limited budget envelope. The demanding Business Unit is the one in charge of building its business case, and justifying the increased IT spending. This new split of responsibility is a significant step to increase the potential adaptability and reactivity of businesses in currently fast changing environments, allowing the CIO office to deliver new business-enabling services instead of being limited by recurrent cost-cutting programs.

Demand forecasting of IT services is becoming crucial, as usage should be fully flexible but it conditions the IT investments (CAPEX) launched by the CIO. This exercise would typically be performed combining top-down guidance and bottom-up forecast consolidations, taking into account past consumptions and trends.

## Charging mechanisms

The metrics used for charging can be variable, but they can be classified into three main groups: following a subscription model, usage model or based on business KPIs.

### Subscription-based charging

This is the easiest and most common charging model used for Software as a Service. It is simply based on the number of registered users for a given service, the unit of time is typically a month, i.e. a user would be charged for the same amount if he is intensively using the service for his daily duties, or just requesting a simple report once a month. With this model

the TCO is obtained with the following simple formula:

$$\text{Total Cost} = \sum_{\text{Services}} \frac{\text{Registered users} \cdot \text{months}}{\text{unitary cost of service}}$$

### Usage-based charging

A more accurate charging model would be based on the actual usage of resources by the end users, it is usually easy to apply in the case of Infrastructure as a Service: a simple example would be for a storage service, where the metrics can be the **maximum disk space** (GB, TB) used during a period of time. For ERP systems, the metrics can be the **activity time** of a user (number of hours) or CPU consumptions. **Transaction-based charging** is also applicable in several cases, one the most common being payment services.

### Business indicators-based charging

Business to IT alignment is important to bridge the "language" gap between Business and IT. While in most contracts Business has to learn how to use and scale IT building blocks, with business indicator-based charging the mapping from IT to business is done at the level of IT. Business is charged on business transactions (High Tech. Transactional Services or Business value Driver). To really link the cost of a service to business benefits, one needs to use more sophisticated metrics depending on the business. Software like CRM may use as a KPI the number of customers or deals included in the system, a Supply Chain Management would rely on the number of declared suppliers and a Payroll solution would use the number of employees. In some cases a very mature business service can be charged according to business outcomes: as example an integrated billing and customer care service for Telco's, could use as a KPI the number of subscribers moving to competitors, showing confidence that the delivered churn prevention mechanisms are best in class.

## Invoicing process

The way internal IT (the provider) will charge the Business Units (users) has to be specified and agreed. The main schemes are: IT Chargeback (actual internal invoicing) or IT Showback (informational invoicing). As one of the main benefits of Liquid IT is financial transparency, we will normally expect the IT Chargeback to be significantly improved: typically from 50% to 80%. The invoicing granularity is also important; the availability of a detailed service catalogue makes fine grain charging possible. In case Internal IT is also providing services to external users, the same invoicing process will be used.

## Service catalog pricing

Each service delivered by internal IT, needs to have an associated charging mechanism and allocation principles. The following table provides a simple example of such methodology:

Service	Chaging	Allocation
Private Cloud Storage	Each 100 GB blocks	Consumption recharged monthly to BU
Server capacity	T-Shirt sized charging based on SAPS or cores.	Monthly recharged to BU
End user service for ERP	Ticket + Hourly rate	Transferred to user's BU
App customization	Hourly rates + licenses	Predetermined Statement of Work
Internet Connectivity	Flat rate	Shared (not recharged)
VoIP	Per device and individual	Monthly recharged
CRM (3 <sup>rd</sup> party SaaS)	User subscription	Recharged
End-User Device	Based on device type (Desktop, Laptop, Thin Client)	Transferred to user's BU
Service Availability	Bonus/Malus model related to Service Availability	Monthly Recharged
Architecture Consolidation	Software versions, Infrastructure (Cloud), Technical consolidation (Technologies) and License Savings	Shared
Logistics	Warehouse Space Optimization	Shared

Liquid IT allows a significant improvement of the usage based IT Chargeback.

## End-to-end financial transparency

The full process toward financial transparency can be summarized with the following diagram:



# Fluid Service Platform

The organizations launching IT Liquefying program need Fluid Service Platforms supporting the evolution to complex hybrid scenarios, where workloads are dynamically allocated between Cloud segments by a comprehensive management of all involved resources (business process, application, computing, storage, and network). Fluid Service Platforms are the evolution of **Platforms as a Service** and enable the benefits mentioned earlier: **Business agility, Flowing capacity, Liquid experience** and **financial transparency**. This chapter describes some of the required building blocks for a Fluid Service Platform, as well as an example of an overall architecture.

## Current limitations of the Cloud infrastructure

One key feature of Cloud Computing is elasticity. Up till now, the Cloud concept of elastic capacity and endless resources is based on the assumption of the network access and infrastructure that provides enough connectivity to the service applications running on the Cloud. This assumption is sufficient for some situations, such as public Clouds executing services that do not require any kind of guaranteed network Quality of Service (QoS) or real-time process coordination. Furthermore, one of the Cloud's essential characteristics for all its service models is the availability of such service over the network. Cloud Computing relies on the network as a vital infrastructure commodity. However, network services are still assumed to be always on by applications. In case the underlying (heterogeneous) physical infrastructure reaches a determined relevant size or spreads over different administrative domains, such as in a federated or multi-Cloud environment, this assumption is not any longer valid. The current situation with un-guaranteed quality of network infrastructure remains a major obstacle to wider implementation of the Cloud concept and services in enterprise applications.

## New developments

To extend the Cloud concept of Service, enabling a **Hybrid Cloud** approach, Virtual Appliance and Data Volumes, Bandwidth on Demand (BoD) services as well as configurable network resources to interconnect them based

on **eNaaS** (extended Network as a Service) model (virtual link, virtual switch, virtual router) are needed. The following problems must to be addressed:

- ▶ Service definition based on SLA
- ▶ Execution platform for service provisioning
- ▶ New network services allowing infrastructure monitoring during the whole lifecycle and dynamic reconfiguration based on user applications needs
- ▶ Composite Network and Cloud Service performance observation and assurance, including both flexible and elastic network customization.

## IPv6 or the Internet Anytime Anywhere

IPv6 is the future of the Internet addressing scheme which can provide each individual person on earth with more than 40 billion objects. In this context, IPv6 is not just about the available address space. Its extension **Mobile IP** allows devices to have static and stable IP addresses while moving between provider networks. In principle, it paves the way for moving servers between provider networks having stable connectivity to their clients. That's Liquid!

**Anytime Anywhere:** Organizations make cloud computing an enabler of the Internet of Things. Here, data and services reside in a massively scalable cloud and can be accessed easily from any connected device over the Internet. Physical location and underlying infrastructure details are transparent to users. Anytime, Anywhere access to IT resources is delivered.

## Security and ease of use

For Liquid IT end users, the location, ownership and provision mode of business services need to be transparent, and at the same time access control, data confidentiality and availability are just supposed to be guaranteed. This dichotomy makes advanced security mechanisms like federated Identity and Access Management, Single-Sign-On and platform-agnostic security frameworks essential components of the Fluid Service Platform.

## Cloud messaging

A fluid Service Platform needs to implement a comprehensive cloud messaging solution, able to offer the following features in a multi-cloud device agnostic:

- ▶ Standardized communication between various entities in a service chain
- ▶ Quality of Services for messaging like SLA, performance, reliability, transaction handling
- ▶ Security in terms of message encryption
- ▶ Cloud Portability for business process continuity when moving workloads from one cloud to another in case of cloud.

## Architecture Design Principles

Liquid IT means flexibility and reliability. On top of all provided services there has to be a solid architecture to support all possible adaptable services. Some principles have to be considered in order to combine both technical requirements, to enable advanced real time services and integration, and of course an economic and adaptable platform.

With the increasing volume of business events and transactions, an agile and context-aware system needs to be able to detect, react and respond to these business events using event-driven business processes (EDA). Service-oriented and event-driven architectural styles provide complementary paths to realize a business architecture that can be modeled, deployed and managed on a middleware platform.

Additionally all demanded services have to be supported by an economic and adaptable platform. A cloud-based architecture, reliable and flexible has to be the enabler of the next generation advanced services as Liquid IT.

## From Build to Run with Fluidity

Liquid IT means improving the relationship between development and operations to achieve more stable and more maintainable systems. The PaaS approach minimizes the distance between delivery lines and system management teams, gives better reporting, finer level component management, higher level API and development methods. Developers have better feedback from the production system, production teams have more opportunities to orient design decisions, and best practices can be exchanged. With a proper team organization, a DevOps culture can be settled, leading to more fluid, faster and safer deliveries.

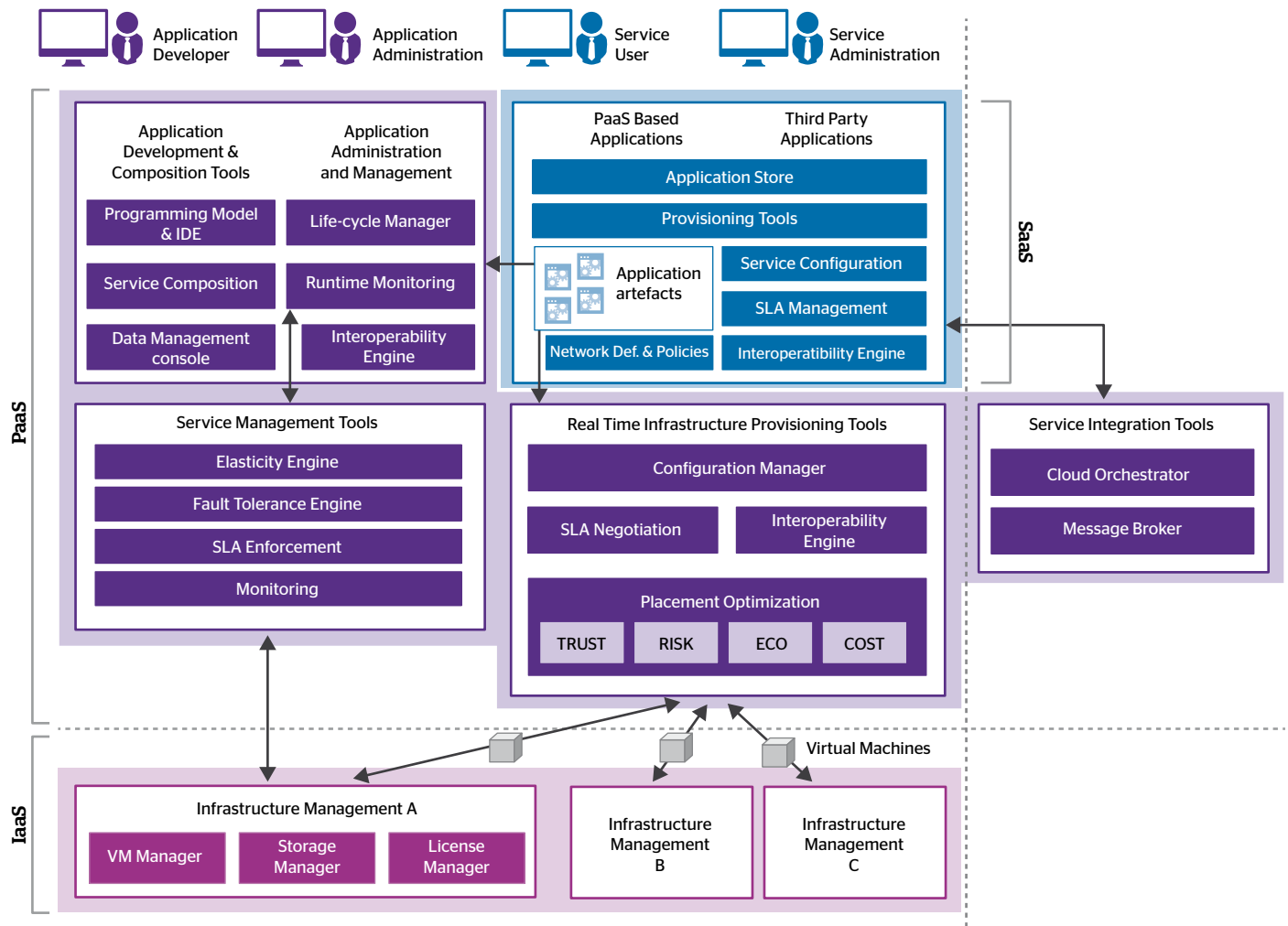
## Example of Fluid Service Platform

A fluid Service Platform should rely on **PaaS** components as technological enablers providing an end-to-end monitored view, with elastic and fault tolerant services among others. **SaaS** components should be used as aggregated application and integrated platforms, and interoperable technology to orchestrate global services.

For more detailed information on PaaS architecture, please refer to the following Atos Scientific Community White Paper, PaaS - Making the Most of Cloud: [atos.net/scientific-community-whitepapers](http://atos.net/scientific-community-whitepapers)

The following picture illustrates an example of architectural view for a Fluid Service Platform.

### Architectural view of a Fluid Service Platform



# Conclusion

As explained in the previous chapters of this White Paper, Liquid IT is a concept of flexible and cost-effective IT services that can be provisioned, built and configured in real time, allowing end-to-end financial transparency. It allows companies to reconfigure their processes in real time. The main implications in terms of Governance as well as the main expected benefits are explained in the following paragraphs.

## Implications

Significant changes are observed in the demand management function: with the control of the quantities, e.g. number of users subscribing to an IT service, moving to Business Units, and the CIO focusing more on unitary costs, quality of service and time to markets.

The objectives of financial transparency dictate that all IT services are associated with agreed processes for allocation, charging and invoicing.

With respect to the CIO office, the headcount is not necessarily affected but new roles (hence skills) are required: e.g. financial controls, internal and external communication, marketing, and more generally front-office capabilities.

## Benefits

This table includes examples of expected benefits and possible targets:

Indicator	Current status	Liquid IT Target
Time to market for new business services	Months	Days
Time to modify a business service SLA	Weeks	Hours
Provisioning time for dev. platform	Weeks	Minutes
Provisioning time for infrastructure	Weeks	Minutes
Usage based Chargeback (% of IT Spending)	30%	90%
IT Budget	Set yearly, owned by CIO	Flexible according to new Business Cases
CAPEX investment	Partly assumed by BU	Consolidated @ CIO
Demand Management	CIO responsibility	Controlled by BUs according to Business Case
Capacity Management		CIO responsibility
CIO Focus	IT Budget control, applications and, infrastructure maintenance	Unit cost and quality of services, time to market, Business KPI
Business facing IT staff	20%	70%

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# Glossary

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<b>BLA</b>	Business Level Agreement
<b>BoD</b>	Bandwidth on Demand
<b>BU</b>	Business Unit
<b>CAPEX</b>	Capital Expenditure
<b>CFO</b>	Chief Financial Officer
<b>CIO</b>	Chief Information Officer
<b>CPU</b>	Central Processing Unit
<b>CRM</b>	Customer Relationship Management
<b>DevOps</b>	Development & operations (a software development method)
<b>EDA</b>	Event-Driven Architecture
<b>eNaaS</b>	extended Network as a Service
<b>ERP</b>	Enterprise Resource Planning
<b>GB</b>	Gigabyte
<b>IPv6</b>	Internet Protocol version 6
<b>IaaS</b>	Infrastructure as a Service
<b>IP</b>	Internet Protocol
<b>IT</b>	Information Technology
<b>ITOM</b>	Information Technology Operating Model
<b>KPI</b>	Key Performance Indicator
<b>LAN</b>	Local Area Network
<b>OPEX</b>	Operational Expenditure
<b>PaaS</b>	Platform as a Service
<b>QoS</b>	Quality of Service
<b>RFI</b>	Request for information
<b>RFP</b>	Request for proposal
<b>SaaS</b>	Software as a Service
<b>SAPS</b>	SAP Application Performance Standard
<b>SLA</b>	Service Level Agreement
<b>SSO</b>	Single Sign On
<b>TB</b>	Terabyte
<b>TCO</b>	Total Cost of Ownership
<b>VoIP</b>	Voice over Internet Protocol
<b>WAN</b>	Wide Area Network

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# About Atos

Atos SE (Societas europaea) is an international information technology services company with annual 2012 revenue of EUR 8.8 billion and 76,400 employees in 47 countries. Serving a global client base, it delivers Hi-Tech Transactional Services, Consulting & Technology Services, Systems Integration and Managed Services. With its deep technology expertise and industry knowledge, it works with clients across the following market sectors: Manufacturing, Retail & Services; Public sector, Healthcare & Transports; Financial Services; Telecoms, Media & Technology; Energy & Utilities.

Atos is focused on business technology that powers progress and helps organizations to create their firm of the future. It is the Worldwide Information Technology Partner for the Olympic and Paralympic Games and is quoted on the NYSE Euronext Paris market. Atos operates under the brands Atos, Atos Consulting & Technology Services, Atos Worldline and Atos Worldgrid.

